# Chapter 5
# Conservation

This chapter discusses energy and natural resource issues associated with using the various substitute blanket washes for lithography. The first part of this chapter focuses on the blanket washing process. Standard shop practices such as the amount of blanket wash consumed, the dilution of the blanket wash, the number of shop wipes used, and the method of wipe management are examined in terms of how they affect energy and natural resource consumption. The chapter then moves on to encompass the entire life cycle of the blanket wash formulations. Chemical composition, product formulation and packaging, and waste disposal are all considered part of the blanket wash life cycle, and their impacts on energy and natural resources are discussed. The energy and natural resource trade-offs that exist when considering standard shop practices and life cycle issues are summarized.

**Chapter Contents**



## 5.1 ENERGY AND RESOURCE CONSERVATION DURING THE BLANKET WASHING PROCESS

Energy and resource conservation are increasingly important goals for all industry sectors, particularly as global industrialization creates more demand for limited resources. Although the blanket washing process is not particularly energy- or resource-intensive, a printer can still help conserve energy and resources through his or her choice of blanket washing products and the manner in which the products are used. These choices have environmental implications not only in the lithographic print shop, but also upstream and downstream in the product life cycle. From an environmental perspective, the life cycle of any product begins with the extraction of raw materials from the environment, and continues on through the manufacture, transportation, use, recycle, and disposal of the product. Each stage within this life cycle consumes both energy and natural resources. This section focusses primarily on energy and natural resource conservation during the blanket washing process, but also considers some of the life-cycle energy and natural resource issues associated with alternative blanket wash products.

To assess the effects alternatives have on the rates of energy and natural resource consumption during the blanket washing process, specific data were gathered during performance demonstrations. The following data were initially requested using the performance survey tool presented in Appendix D:

- the amount of chemical product consumed during each blanket washing step
- the dilution of the product
- manual or automatic rotation of blanket during washing
- the number of shop wipes required to attain an adequate level of cleanliness
- the size of the wipe and whether it is disposable or reusable
- the size of the blanket and ink coverage
- method of wipe management
- quantity of waste print run

Though much of these data were collected, statistically meaningful conclusions could not be drawn from the compiled data. Ink coverage, chemical wash volumes applied, and operator variations, just to name a few possibilities, introduced enough uncertainty and variability to prevent the formulation of quantifiable conclusions. Discussed below, however, are energy and resource conservation issues to consider when cleaning the blanket and purchasing blanket washing products.

The primary resources consumed or used during the blanket washing process include the blanket wash product itself, disposable or reusable wipes, and the waste print run required to attain adequate print quality following blanket washing. The use of disposable or reusable wipes and the amount of waste print run also are important from an energy conservation perspective.

Some blanket washing methods may require the use of a greater amount of chemical wash than others. The amount of chemical wash required to clean the blanket should be optimized to the extent possible, whether the process is automated or manual, to avoid unnecessary use of resources. Optimization depends on the chemical product selected for blanket washing, the extent of ink coverage on the blanket, the washing technique employed, the time allowed for the ink to dry before cleaning, as well as other factors. Changes in the standard operating procedures and cleaning techniques should be conducted to identify optimal parameters. Potential changes can be identified through case studies, discussions with other printers at association meetings and seminars, and other sources.

The use of reusable or disposable wipes to wash the blanket is of importance when considering both energy and natural resource consumption. Reusable wipes, though viewed by many as an act of conserving natural resources, consume a considerable quantity of energy, water, and chemical cleaning agents to clean and prepare them for reuse. Cleaning of reusable wipes via dry-cleaning or aqueous processes uses natural resources such as solvents for dry cleaning, water for aqueous laundering, and detergents. Energy to heat the cleaning solutions, as well as dry and press the wipes, all require significant energy inputs. The disposable wipes consume energy and natural resources in their manufacture and natural resources in their single-use applications, as well as create a solid waste disposal issue (addressed below, Disposal).

Without quantifying the rates of energy and resource consumption throughout their life cycles, it is unclear which is the preferred wipe from the perspective of energy and natural resources use. Standard practices within the print shop, however, can minimize the consumption of energy and natural resources. Optimizing the use of wipes (whether reusable or disposable) should be strived for in the shop; proper management of the used wipes should be followed (see Disposal, below); and when using reusable wipes, influencing the supplier to optimize energy, water, and chemical detergent use offers an opportunity for printers to influence the product chain of which they are a part.

Energy consumption during the blanket washing process itself is negligible for the manual blanket cleaning methods employed by small print shops that were the focus of this CTSA. These blanket washing procedures typically rotate the blanket manually while applying and wiping the wash from the blanket to remove the ink. This practice conserves energy while maintaining safe working conditions. Energy and natural resources are consumed, however, during the waste print run. Whether the blanket is washed manually or automatically, a waste print run is required to attain adequate print quality following blanket washing. Minimization of these waste runs will minimize both energy and natural resource consumption.

## 5.2 ENERGY AND RESOURCE CONSERVATION BASED ON CHEMICAL COMPOSITION, FORMULATIONS, AND PACKAGING

The chemical composition of a blanket wash product, the manner in which the product is formulated, and the type of packaging all influence the overall rates of energy and resource consumption of a blanket washing product. These issues are particularly important from a life-cycle perspective, as discussed below.

Chemical Composition

Chemicals used in the formulations of blanket washing products are derived from a variety of raw materials. Solvents traditionally used in blanket washing products are derived from petroleum or natural gas; categories such as the mineral spirits and aromatic hydrocarbons are examples of these solvents. Other chemicals can be derived from plant products; fatty acid derivatives and select examples of the terpenes categories are examples of these chemicals.

The extraction, processing and transportation of these various raw materials result in different energy consumption and natural resource use issues. Petrochemical raw materials originate from crude oil which must be pumped from reserves deep in the earth. These reserves are typically transferred via pipeline to processing facilities (refineries) where large quantities of energy are used to separate and react the crude oil into various petrochemical products and by-products. The use of petroleum for the production of solvents, however, is small when compared to the amount of petroleum consumed as fuel.

This consumption of energy must be contrasted with the energy used to harvest, transport, and process plants into chemical raw materials. Plants and fruits are seasonally harvested in various regions of the U.S. and abroad. Transport to the processing facilities is by truck or rail. These raw materials are then chemically and mechanically processed to extract the desired chemical products. Some of these processes utilize petrochemical products to extract the desired chemicals from the plant. Some plant and fruit sources are by-products from the food processing industry, and are therefore taken from a stream that may traditionally be viewed as a waste.

The depletion of non-renewable resources, such as petroleum, is of importance when considering natural resource consumption. Renewable resources, such as plant-derived chemicals, do not require extensive use of non-renewable fuels for extraction and production. From the representative generic formulations applied in the performance demonstrations, however, products often mix non-renewable and renewable chemical raw materials in one formulation.

Product Formulation and Packaging

When contacted, manufacturers of blanket washing products indicated that the same basic processes are used to formulate blanket washing products, regardless of the types of ingredients. Therefore, no significant differences between products are expected in energy consumption during the product formulation process. The specific steps required for production (e.g., mixing, application of pressure or heat, etc.) is dependent on the specific product chosen. Differences in the use of natural resources in this formulation step, beyond the formulations themselves, are also expected to be minimal.

Differences in energy and natural resource consumption may exist, however, when the nature of the product and its packaging are considered. Some formulations are concentrated and require dilution with water at the print shop; others already contain water and are ready to use right from the shipping container. (Still others are not diluted with water, either at the manufacturer or at the print shop). The concentrated formulations evaluated in this assessment,

such as formulations No. 12, 17, 22, 24, 30, and 33, occupy less volume and therefore require less packaging when shipped to printers when diluted on site. Furthermore, energy consumed during the transportation/distribution of a concentrated product is less than that of a diluted product.

The materials in which the formulations are packaged should also be considered. In general, packaging containing recycled content and which is recyclable reduces resource consumption (and possibly energy use) as compared with disposable packaging materials. Reusable packaging may be even more beneficial than recycled/recyclable packaging depending on the energy required for transport and reuse.

Waste Disposal

Differences may exist in the amounts of energy and natural resources consumed during the disposal of blanket washing waste streams. The use of disposable wipes or shop towels creates a solid waste stream that must be properly managed. A similar waste stream generated by automated systems are the disposable pads used to remove the ink and applied wash; this pad represents consumption of natural resources similar to disposable wipes and must be compared to the use of reusable/disposable wipes. This use of disposable shop towels clearly consumes natural resources. However, from the discussion above, reusable shop towels also consume significant quantities of natural resources for cleaning purposes. Optimizing the use of either wipe alternative is most desirable.

Chemical wash recycling can be accomplished though centrifuging, hand-wringing, or gravity draining wash-soaked wipes. While recycling of waste blanket wash conserves natural resources, it also consumes energy. For example, centrifugation requires the use of equipment which consumes energy. Further processing of the collected chemicals, such as distillation, may be required, and therefore represents further energy consumption. These energy issues, and the issues of natural resource use, should be considered to capture the full life-cycle costs and benefits of blanket wash alternatives and the methods used to apply and manage the materials. Recycling of waste solvents is usually preferred over disposal, as established in the national waste management hierarchy outlined in the Pollution Prevention Act of 1990.

## 5.3 COMPARISON OF LIFE-CYCLE TRADE-OFF ISSUES

Printers should consider the life cycle of alternative blanket washing products if the goal is to conserve energy and natural resources. Only by considering and comparing the energy use and natural resource consumption of each life cycle stage can a completely informed decision be made. Though a quantitative evaluation of each life-cycle stage is beyond the scope of this CTSA, printers can still consider the life cycle trade-offs to optimize the blanket washing process and the overall consumption of energy and natural resources. There is rarely a clearly preferred choice, however, when considering the life-cycle energy and natural resource impacts of a selected product. Table 5-1 summarizes some of the trade-offs when considering energy consumption and natural resources use.

**Table 5-1. Summary of Trade-Offs When Considering Energy Consumption and Natural Resources Use**

| | Energy Issues | Natural Resource Issues |
|---|---|---|
| Standard Shop Practices | no clear distinction between reusable and disposable wipes or shop towels | |
| | optimizing cleaning process and minimizing waste print run conserves energy and natural resources | |
| Chemical Composition | no clear distinction between products concerning renewable and non-renewable resources | |
| Formulation and Packaging | concentrated formulations consume less energy during transport/distribution when diluted on site | concentrated formulations require less packaging thus reducing natural resource consumption |
| | | packaging containing recycled content and which is recyclable reduces natural resource consumption |
| Disposal | recycling waste blanket wash consumes energy (e.g., centrifugation, distillation, etc.) | collection and reuse/recycling of waste blanket wash conserves natural resources |